Enhanced Waterbody Assessment: Bel Marin Keys

Sample Date: 18 Jul 2025

Test	Desired Range	Action Range	Surface	Bottom	This lake is
Phosphorus, Total	< 30 ppb	> 100	1300	1300	High
Phosphate	< 30 ppb	> 100	1000	1000	[illegible] HIGH
Nitrogen, Total	<1,200 ppb	> 2,000	430	460	Healthy
Nitrate	<1,200 ppb	> 2,000	ND	ND	Healthy
Ammonia	< 100 ppb	> 250	ND	ND	Healthy
Conductivity		NA	31308	31548	Saline
Total Dissolved Solids		N/A	20350	20506	Saline
Salinity		N/A	19.48	16.64	Saline
Total suspended solids	<20 mg/L	20 mg/L	15.6	6.8	Healthy
Turbidity	< 5 NTU	NA	3.82	7.02	High
pH reading	6.5 - 8.5	NA	8.42	8.42	High
COD	<100 mg/L	495 mg/L	360	660	High

Acres:114

Average Depth (feet): 8

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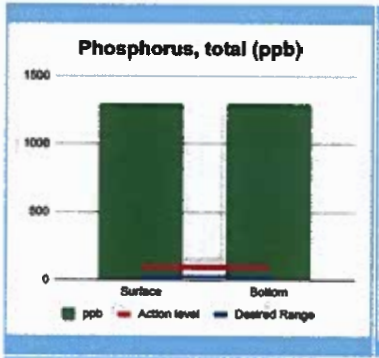
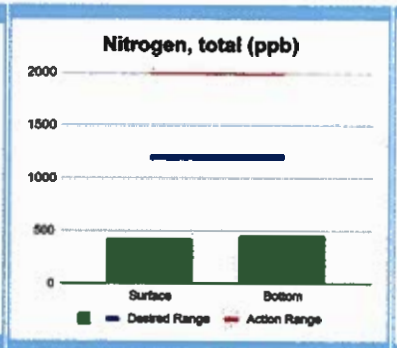
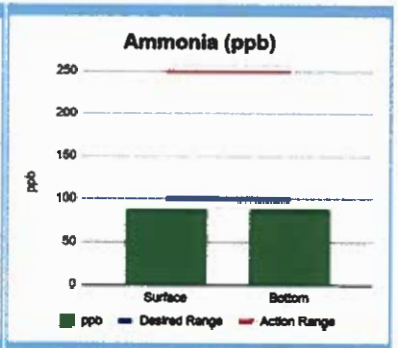
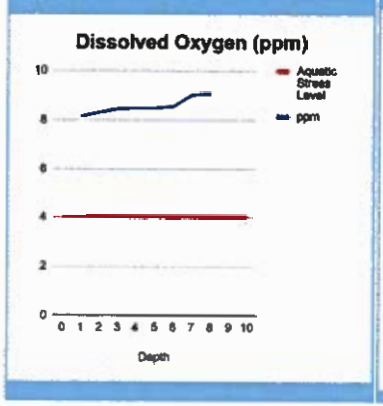
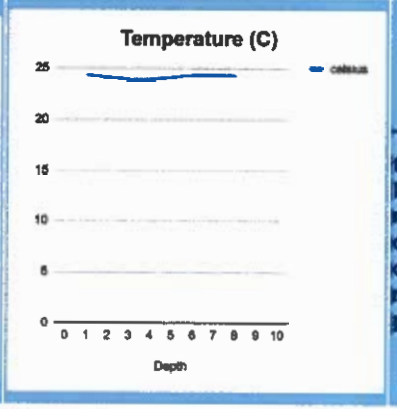










Water Column Profile:

The dissolved oxygen and temperature profile shows this lake's water column is adequately mixed resulting in acceptable dissolved oxygen levels at lower depths. It is recommended to monitor oxygen levels closely, particularly with seasonal changes.

Observations

First noticed on the lagoon is a large amount of widgeon grass and algae. Further investigation showed a heavy layer of muck across the bottom of the lagoon, as well very high phosphorus contributing to the extremely high chemical demand. Not only are these signs of eutrophication driving up COD but adding to the high growth of nuisance algae and vegetation.

Recommendations

- Phosphorus reduction
- Watershed management
- Ongoing water quality monitoring
- COD management

Enhanced Waterbody Assessment: Bel Marin Keys

Sample Date: 18 Jul 2025

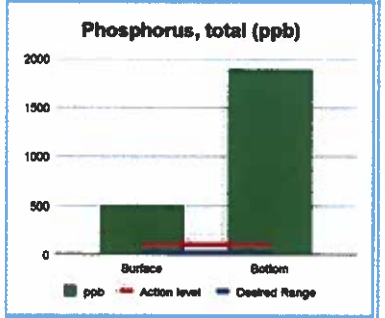
Test	Desired Range	Action Range	Surface	Bottom	This lake is
Phosphorus, Total	< 30 ppb	> 100	510	1900	High
Phosphate	< 30 ppb	> 100	100	100	Healthy
Nitrogen, Total	<1,200 ppb	> 2,000	920	1200	Healthy
Nitrate	<1,200 ppb	> 2,000	ND	ND	Healthy
Ammonia	< 100 ppb	> 250	ND	ND	Healthy
Conductivity			29711	29582	Saline
Total Dissolved Solids			19312	19228	Saline
Salinity			18.4	18.31	Saline
Total suspended solids	<20 mg/L	20 mg/L	20.4	6990*	High
Turbidity	< 5 NTU	NA	10.25	305.35*	High
pH reading	6.5 - 8.5	NA	8.11	8.05	High
COD	<100 mg/L	495 mg/L	400	720	High

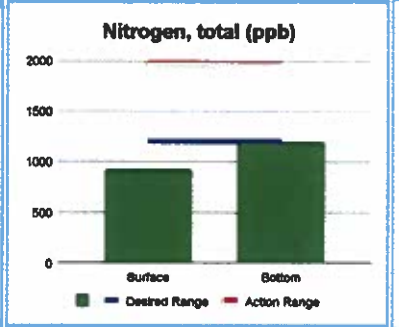
Acres: 160

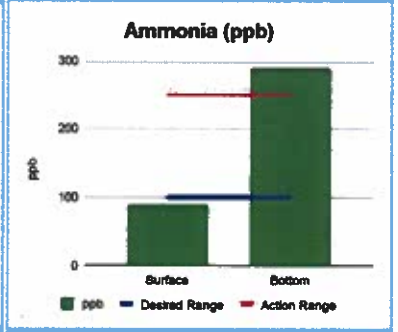
Average Depth (feet): 27

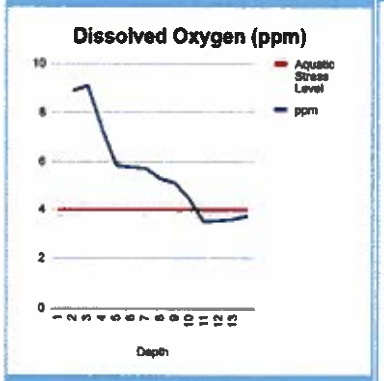
Enhanced Waterbody Assessment: Bel Marin Keys

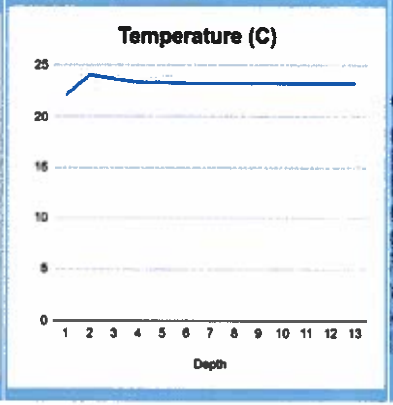
Sample Date: 18 Jul 2025











Water Column Profile:

The oxygen profile suggests that oxygen levels decrease with depth. It is possible that this waterbody is in the process of stratifying or has elevated biological oxygen demand at depth. This often leads to fish kills, algae blooms, muck accumulation and foul odors. A common sign of a eutrophied, or hypereutrophic lake.

Observations

There is a very high phosphorus load that is likely fueling the planktonic algae bloom occurring in the water. The sediment samples came back phosphorus-dense consisting of high organic material. Based on the consistent temperature but low oxygen levels at the bottom, there is high biological demand. The extremely high chemical oxygen demand shows that there is a high use of the available oxygen in the system, overwhelming the lake.

*There was high sediment at the bottom of that sample, skewing the results,higher than what is normal.

Recommendations

- Aeration for water column mixing
- Phosphorus reduction
- Watershed management
- Ongoing water quality monitoring
- COD management

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Sediment testing results

Test	Desired Range	Action Range	North	South	This lake is
Phosporus, Total	< 400 mg/kg	>2000 mg/kg	92	22	Healthy
Phosphate	<50 mg/kg	>300 mg/kg	6.5	5.7	Healthy
Nitrogen, Total	<1000 mg/kg	>5000 mg/kg	3.5	ND	Healthy
Nitrate	<10 mg/kg	>50 mg/kg	ND	ND	Healthy
Ammonia	<50 mg/kg	>300 mg/kg	3.5	ND	Healthy
Moisture %	There are no ranges for these factors; the values will serve as a baseline for future testing		70	95.8	Baseline
Ash %			93	87	Baseline
Organic Matter %			7.4	13	Baseline
Sand %			0	0	Baseline
Silt %			0	0	Baseline
Clay %			100	100	Baseline

Initial tests showed lower than expected nutrient levels in the sediment; however, there is a high amount of organic matter that is mixed in with the sediment. The larger organics are removed as part of the testing procedure for phosphorus, phosphate, nitrogen, nitrate, and ammonia to not skew the results. These organics can become bioavailable over time as natural decomposition processes occur. Future test can be done to a higher standard to show more in depth analysis on the lake bottom.

Glossary

Water Quality Parameter	Desired Range	Action Level	Non-normal results may lead to	Common causes of non-normal levels
Phosphorus, total, Phosphate	< 30 ppb	> 100 ppb	Excessive algae growth, muck accumulation, nuisance midge fly population, unbalanced fishery, etc.	Reclaimed water discharge, landscape fertilizer runoff and agricultural drainage, phosphorus laden bottom sediments
Nitrogen, total, nitrate	< 1,200 ppb	> 2,000 ppb	Excessive algae growth, muck accumulation, nuisance midge fly population, unbalanced fishery, etc.	Reclaimed water discharge, landscape fertilizer runoff and agricultural drainage, organic material input like grass clippings and leaf litter
Ammonia	< 100 ppb	> 250 ppb	May lead to fish kills and stress on aquatic life, especially under high pH conditions	Organic decomposition, landscape/fertilizer runoff, and anoxic conditions (low oxygen), excessive waterfowl excrement
Dissolved Oxygen	> 4 ppm	N/A	Nutrient recycling from the sediments (phosphorus), may cause fish kill events, foul odors, stress on aquatic life etc.	Stratification, higher than normal biological oxygen demand
Temperature	< 4 degree difference	N/A	Low dissolved oxygen, nutrient recycling, and unbalanced ecosystems	Natural processes
Conductivity, Total dissolved solids, Salinity		N/A	Fish kills for salt intolerant species, damage to turf through irrigation, change in algae community (golden algae)	Salt water intrusion, road salt runoff, excessive additions of reclaimed / effluent water
Total Suspended Solids	<10 mg/L	20mg/L	Loss of clarity in water and in extreme conditions fish kills	Sediment run-off, bottom sediment in suspension, Sediment inflow
Turbidity	< 5 NTU	N/A	Loss of clarity in water and in extreme conditions fish kills	Sediment run-off, bottom sediment in suspension, algae blooms, etc.
pH reading	6.5 - 8.5	N/A	Unbalanced ecosystems and potentially fish kill events	Watershed run-off, pool discharges, algae blooms, etc.
Chemical Oxygen Demand (COD)	<100	495	Nutrient recycling from the sediments (phosphorus), may cause fish kill events, foul odors, etc.	High pollution from decaying organic material, runoff and wastewater

^The above thresholds are general goals that have been determined by decades of lake management experience from our lake management team and a variety of peer reviewed journal studies.